# National Child Care Information Center

*A service of the Child Care Bureau*

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## MATH and SCIENCE in EARLY CHILDHOOD

Early childhood educators know that a young child's natural interest and curiosity can be used as a basis for learning, understanding, and enhancing mathematics skill acquisition and concept development. They understand that science and math are all around in a child's world and should be treated as an integral part of a curriculum. Researchers and early childhood educators are exploring how a child's reasoning capabilities in mathematics and science develop across the early childhood years and are examining how this knowledge can be translated into practice. They are also recognizing the importance of complementing child-initiated learning with high-quality, teacher-directed mathematics instruction in the early years. The following selected resources describe ways in which parents and early childhood educators can become more involved in the development of children's early math and science skills.

### FEDERAL AGENCY

■ **U.S. Department of Education:**
400 Maryland Avenue SW
Washington, DC 20202
800-USA-LEARN (872-5437)
World Wide Web: http://www.ed.gov

The U.S. Department of Education publishes a wealth of information for teachers, administrators, policy-makers, researchers, parents, students, and others with a stake in education. Publications about math and science for young children include:

- *Helping Your Child Learn Mathematics* (March 2004) provides fun activities that parents can use with children from preschool age through 5th grade to strengthen their math skills and build strong positive attitudes toward math. This resource is available in English on the Web at http://www.ed.gov/parents/academic/help/math/index.html and in Spanish [Cómo ayudar a su hijo con las matemáticas] at http://www.ed.gov/espanol/parents/academic/matematicas/index.html.

- *Helping Your Preschool Child with Activities for Children from Infancy through Age 5* (2002) includes strategies for fostering early literacy and early math skills. This resource is available in English on the Web at http://www.ed.gov/parents/academic/preschool/preschool.pdf and in Spanish [Cómo ayudar a su hijo de edad preescolar] at http://www.ed.gov/espanol/parents/academic/preescolar/preescolar.pdf.

- *Early Childhood: Where Learning Begins: Mathematics*, (July 1999), by Carol Sue Fromboluti and Natalie Rinck, includes mathematical activities for parents and their 2– to

5–year–old children to do during the course of the day. This resource is available on the Web at http://www.ed.gov/pubs/EarlyMath.

- *Learning Partners: Let's Do Math!* (July 1999) suggests activities parents can do with their children to help them learn math. This resource is available on the Web at http://www.ed.gov/pubs/parents/LearnPtnrs/math.html.

- *Learning Partners: Let's Do Science!* (July 1999) suggests activities parents can do with their children to help them learn science. This resource is available on the Web at http://www.ed.gov/pubs/parents/LearnPtnrs/science.html.

- *Early Childhood: Where Learning Begins: Geography* (February 1999), by Carol Sue Fromboluti and Carol Seefeldt, offers ideas for activities that can help young children ages 2–5 learn geography. This resource is available on the Web at http://www.ed.gov/PDFDocs/geography.pdf.

- *Learning Partners: Let's Do Geography!* (1999) is a resource to help children learn geography. It contains questions to ask children and suggested activities. This resource is available on the Web at http://www.ed.gov/pubs/parents/LearnPtnrs/geog.html.

For additional information about ordering publications, contact EdPubs at 877-4-ED-PUBS (433-7827) or on the Web at http://www.edpubs.org/webstore/Content/search.asp.

## STATE and NATIONAL ORGANIZATIONS

■ **Building Blocks**
University at Buffalo, State University of New York
505 Baldy Hall
Buffalo, NY 14260
716-645-2455 Ext. 1155
World Wide Web: http://www.gse.buffalo.edu/org/buildingblocks/index_2.htm

Building Blocks is a project of the National Science Foundation (NSF). It is creating mathematics curriculum materials for young children. The Building Blocks project will create exemplary mathematics materials designed to enable all young children to meet the new prekindergarten–2nd grade standards developed by the National Council of Teachers of Mathematics. These materials will supplement and enrich, rather than completely replace, existing curricula. They will use computers extensively, in coordination with hands-on activities.

■ **Illinois Early Learning Project**
World Wide Web: http://www.illinoisearlylearning.org

The Illinois Early Learning Project Web site, funded by the Illinois State Department of Education, provides evidence-based, reliable information on early care and education for parents, caregivers, and teachers of young children in the State of Illinois. *Resources on Early Learning: Tip Sheets* include short tip sheets for math and science, as well as other topics, that are intended to be shared widely. These tip sheets are available in English and Spanish on the Web at http://www.illinoisearlylearning.org/tips.htm.

■ **National Association for the Education of Young Children (NAEYC)**
1509 16th Street NW
Washington, DC 20036-1426
800-424-2460
World Wide Web: http://www.naeyc.org

NAEYC is the nation's largest organization of early childhood educators and others dedicated to improving the quality of programs for children from birth through 3rd grade. The following position paper describes NAEYC's position on early childhood mathematics:

- *Early Childhood Mathematics: Promoting Good Beginnings* (April 2002), a joint position statement by NAEYC and the National Council for Teachers of Mathematics (NCTM), discusses the importance of children's early years as a crucial time to learn mathematics. The document includes recommendations to improve both curriculum and teaching for children from 3–6 years of age. This resource is available on the Web at http://naeyc.org/about/positions/pdf/psmath.pdf. A summary is available on the Web at http://naeyc.org/about/positions/psmath.asp.

NAEYC has several publications related to math and science, including:

- *Worms, Shadows and Whirlpools: Science in the Early Childhood Classroom* (2003), by Karen Worth and Sharon Grollman, identifies important science inquiry skills and concepts appropriate for the very young. It makes a case for integrating science into the curriculum right from the start—creating a context for the development of language, mathematical thinking, and social skills. It draws upon what is known about the learning, effective teaching, and science education of young children by using the daily work of teachers and children in Head Start, kindergarten, child care, and preschool programs. Additional information is available on the Web at http://www.naeyc.org/shoppingcart/Itemdetail.aspx?Stock_No=139&Category=CFeatured&SText.

- *State Policies that Promote Early Childhood Mathematics* (June 2003), by Sheri Azer, looks at requirements of professional development in mathematics education for teachers of young children; State standards on early childhood mathematics, including early learning, content, and program standards; requirements for the use of specific mathematics curriculum; and requirements for the use of methods to assess children's knowledge and skill in mathematics. This resource is available on the Web at http://www.naeyc.org/ece/critical/pdf/math_survey.pdf.

- *The Young Child and Mathematics* (2000), by Juanita V. Copley, published by National Council of Teachers of Mathematics (NCTM) and NAEYC, considers the teacher's role as one of helping the children move from what they currently know to more formal math knowledge. It uses classroom play situations, teacher strategies, and teacher-initiated ideas to promote development in six math areas, including geometry, measurement, and number concepts. Additional information is available on the Web at

http://www.naeyc.org/shoppingcart/Itemdetail.aspx?Stock_No=119&Category=CFeatured&SText=.

- *The Block Book* (1996), 3rd ed., edited by Elizabeth S. Hirsch, is a compilation of the practical and theoretical meanings of block play in the early childhood and elementary curriculum. It explores the values and uses of unit blocks for extending children's growth and development. Additional information is available on the Web at http://www.naeyc.org/shoppingcart/Itemdetail.aspx?Stock_No=132&Category=C&SText=block%20book.

*Young Children* is NAEYC's bi-monthly journal. *Beyond the Journal* is a section of the NAEYC Web site that complements *Young Children*'s topical issues and features additional resources along with full-text articles. The following two issues of *Beyond the Journal* address math and science:

- *Teaching and Learning about Math* (January 2003), in *Beyond the Journal*, features a cluster of articles about encouraging math skills and positive motivation to learn math with young children. These include the following articles.

    - "Algebra in the Early Years? Yes!"by Jennifer Taylor-Cox, is available on the Web at http://www.journal.naeyc.org/btj/200301/Algebra.pdf.

    - "More Math Games Based on Children's Literature," by Kay M. Cutler, Deanna Gilkerson, Sue Parrott, and Mary Teresa Bowne, is available on the Web at http://www.journal.naeyc.org/btj/200301/MathGames.pdf.

    - "Using 'The Pizza Project' to Address Learning Standards" is available on the Web at http://www.journal.naeyc.org/btj/200301/PizzaProjectStandardsChart.pdf.

    - "Choosing Books You Can Count On," by Pat Dickinson, is available on the Web at http://www.journal.naeyc.org/btj/200301/ChildrensBooks.pdf.

    - "Glossary of Math Terms," compiled by Heather S. Benson, is available on the Web at http://www.journal.naeyc.org/btj/200301/ChildrensBooks.pdf.

    - "Links to Online Math Resources" is available on the Web at http://www.journal.naeyc.org/btj/200301/onlinemath.asp.

- *Science in the Preschool Classroom: Capitalizing on Children's Fascination with the Everyday World to Foster Language and Literacy Development* (September 2002), in *Beyond the Journal*, features a cluster of articles about encouraging science skills and positive motivation to learn science with young children. These include the following articles.

    - "Science in the Preschool Classroom: Capitalizing on Children's Fascination with the Everyday World to Foster Language and Literacy Development," by Kathleen

Conezio and Lucia French, is available on the Web at http://www.journal.naeyc.org/btj/200209/ScienceInThePreschoolClassroom.pdf.

- "Science at the Center of the Integrated Curriculum: Ten Benefits Noted by Head Start Teachers" is available on the Web at http://www.journal.naeyc.org/btj/200209/ScienceAtTheCenterOfTheIntegratedClassroom.pdf.

- "Using Language During Science Activities" is available on the Web at http://www.journal.naeyc.org/btj/200209/UsingLanguageDuringScienceActivities.pdf.

- "Color and Light Integrated Planning Wheel" is available on the Web at http://www.journal.naeyc.org/btj/200209/UsingLanguageDuringScienceActivities.pdf.

- "Quick Recipe Science Unit" is available on the Web at http://www.journal.naeyc.org/btj/200209/QuickRecipeScienceUnit.pdf.

- "Familiar Children's Books Related to Science Topics" is available on the Web at http://www.journal.naeyc.org/btj/200209/FamiliarChildrensBooks.pdf.

*Early Years Are Learning Years* is a regular series from NAEYC providing tips to help parents and early childhood educators give young children a great start on learning. It includes the following articles.

- *Science and Literacy* (November 2002), an *Early Years Are Learning Years* release, illustrates how children's natural interest in science can be the foundation for developing language and literacy skills by giving children something to talk, read, and write about. This resource is available on the Web at http://www.naeyc.org/ece/2002/11.pdf.

- *Mathematics through Play* (September 2002), an *Early Years are Learning Years* release, explores how everyday routines and play events can offer rich opportunities for teaching young children about mathematics. This resource is available on the Web at http://www.naeyc.org/ece/2002/09.pdf.

- *Starting Children on Science* (February 2002) an *Early Years are Learning Years* release, discusses how children's early encounters with nature help children develop ideas about our world based on experiences with real things. It suggests how teachers can support children's explorative play by giving them the time, space, and equipment needed for investigating the world around them and by encouraging children's explorations. This resource is available on the Web at http://www.naeyc.org/ece/2002/02.asp.

■ ***PBS Parents***

World Wide Web: http://www.pbs.org/parents/

*PBS Parents* includes suggestions for activities for parents to do with their children using PBS Kids TV shows. Its multimedia resources include print materials, slideshows that summarize information on a page, and video clips. The *PBS Parents* site is funded in part by a Ready To Learn cooperative agreement with the U.S. Department of Education.

■ **Ready to Learn**

World Wide Web: http://pbskids.org/readytolearn

This initiative promotes literacy and school readiness by teaching parents and caregivers how to use public television as an educational tool. The Ready To Learn coordinator at each station is responsible for conducting 20 outreach workshops per year, distributing 300 children's books per month to low-income families, distributing a biannual magazine, and engaging in professional development training. PBS Ready To Learn is supported by a cooperative agreement from the National Institute on Early Childhood Development and Education in the U.S. Department of Education through the Corporation for Public Broadcasting. The Web site includes links for caregivers and parents to educational philosophies, educator guides, and at-home activities related to these programs.

## ADDITIONAL RESOURCES

■ *Thrive by Five: Teaching Your Preschooler about Spending and Saving* (2005), prepared by the Credit Union National Association, Inc., (CUNA), provides free educational activities and resources to help parents and professionals working with preschoolers teach basic money concepts. These resources are available on the Web at http://www.creditunion.coop/pre_k/.

■ *Mathematical and Scientific Development in Early Childhood: A Workshop Summary* (2005), ed. Alix Beatty, by the National Research Council of the National Academies, published by the National Academies Press, summarizes discussions at a one-day workshop that was designed as an initial step in exploring the research in cognition and developmental psychology on children's capacity to learn mathematical and scientific ideas. The workshop also focused on curricular and resource materials for mathematics and science found in early childhood education settings. This resource is available on the Web at http://www.nap.edu/books/0309095034/html/.

■ *Assessing Instructional Practices in Early Literacy and Numeracy* (November 2004) published by Abt Associates, Inc., summarizes the proceedings of a conference held in September 2002. The conference addressed key skills 3- to 5-year-olds need for early literacy and mathematics development, current research, and tools that measure instructional quality. "Appendix 4: Numbers, Shapes, and Pattern in Preschool" by Robin Tepper Jacob, provides a brief overview of what is known about teaching mathematical knowledge and skills to young children. It describes four early math curricula that conform to the National Council of Teachers of Mathematics (NCTM) standards, including:

- Number Worlds (formerly the Rightstart Program);
- Big Math for Little Kids;

- Mathematics Problem-Solving Adventures: A Story Telling Approach to Teaching Early Childhood Mathematics; and
- Building Blocks.

For ordering information, contact Abt Associates, Inc. at 617-492-7100.

■ "Math and Numbers Part 2" (July/August 2004), a *Beginning Workshop*, in *Child Care Information Exchange*, published by Child Care Exchange, includes information on the history of math in the preschool classroom, math and music, and math in after-school programs. Additional information is available on the Web at http://mail.ccie.com/go/eed/0586.

■ *Early Childhood Research Quarterly* (2004) Vol. 19, No.1, is focused on young children's development of math and science concepts. It includes seven research articles that address critical questions about young children's learning in mathematics and science. It also includes six articles that examine innovative practices in mathematics and science.

■ "Numbers and Math" (May/June 2003), a *Beginning Workshop*, in *Child Care Information Exchange*, published by Child Care Exchange, includes information about math talk, how children understand numbers, assessing math learning, and using math outdoors and at home. Additional information is available on the Web at http://mail.ccie.com/go/eed/0586.

■ "Early Math: the Next Big Thing" (2003), by Ann Epstein, in *High Scope Resource*, published by High Scope Press, notes that teachers must work with children's interests and systematically introduce mathematical experiences into the early childhood curriculum. Teachers can promote learning in five areas of mathematics; classification, seriation, number, space, and time. This resource is available on the Web at http://www.highscope.org/EducationalPrograms/EarlyChildhood/EarlyMath.pdf.

■ *Chicago Public Schools: Early Mathematics: a Framework* (2002), by the Chicago Public Schools Office of Public School Instruction, provides teachers with a framework of best practices in preschool mathematics instruction through activities that will help children learn, develop, and understand mathematics skills and concepts. The framework recognizes that mathematics is more than just a "subject" to be taught in isolation and that high quality mathematics instruction takes advantage of that natural curiosity about the environment. Because mathematics is vital to understanding and making sense of the world around us, it is integrated throughout the day and within all activities. This framework emphasizes the importance of documentation and assessment in the early childhood setting., This resource is available on the Web at http://www.ecechicago.org/pages/home/teacher/Early_Math.

■ *Adding It Up* (November 2001), eds. Jeremy Kilpatrick, Jane Swafford, and Bradford French, for the Center for Education Division of Behavioral and Social Sciences and Education, National Research Council, published by National Academy Press, present the results of the Mathematics Learning Study Committee concerning what needs to be done to boost the mathematical performance of America's students. It explores how students in prekindergarten through 8th grade learn mathematics and recommends how teaching, curricula, and teacher

education should change to improve mathematics learning during these critical years. This resource is available on the Web at http://www.nap.edu/books/0309069955/html/index.html.

■ "Helping Your Child With Science" (1999), an *ERIC Digest*, by David L. Haury and Linda A. Milbourne, suggests guidelines and resources to help parents nurture interest and uccess in science among their children. This resource is available on the Web at http://www.ericdigests.org/2000-1/child.html.

■ "Helping Your Child Learn Math" (1998), an *ERIC Digest*, by David L. Haury and Linda A. Milbourne, suggests strategies parents can use to help children with math skills. This resource is available on the Web at http://www.ericdigests.org/2000-2/math.htm. .

The National Child Care Information Center does not endorse any organization, publication, or resource.